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EXAMINER

NGUYEN, HA T

ART UNIT PAPER NUMBER

2812

DATE MAILED: 04/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/779,812

Applicant(s)

RAY ET AL.

Examiner

Ha T. Nguyen

Art Unit

2812

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 February 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10, 12-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10, 12-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) _____
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152) _____
- 6) ☐ Other: _____

DETAILED ACTION

Notice to applicant

1. Applicants' Amendment and Response to the Office Action mailed 11-20-02 has been entered and made of record (Paper No. 16).

Response to Amendment

2. In view of Applicants' arguments, the rejection of claims 35 and 36 under 35 U.S.C. 112 first paragraph, has been withdrawn.

Applicants' arguments with regard to the rejections under 35 U.S.C. 102 or 103 have been fully considered, but they are not deemed to be persuasive. The response to these arguments will be incorporated in the modified ground of rejection given below.

1-10, 12-36 Claim Rejections - 35 USC § 112

3. Claims 1, 7, 20, and 24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1, 7, 20, and 24 recites the limitation "consists essentially" in line 4 of each claim 1, 7, and 20, line 6 of claim 24 and "consisting essentially" in line 6 of each claim 1, 7, and 20, and line 8 of claim 24. It is not clear how much of other materials can be included. The specification discloses in page 16, lines 4-6 that "small or trace amounts of other metals such as, inter alia, copper, bismuth, zinc, silver, nickel" can be included but does not disclose what amount would be considered "small".

8-10, 12-36
Claims 2-6, 8-10, 12-36 variously depend from claims 1, 7, 20, or 24, they are rejected for the same reason.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

Art Unit: 2812

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-3, 6, 20, 21, 23, 31, and 33 are rejected under 35 U.S.C. 102(b) as being anticipated by Ogashiwa, Australian Patent AU-B-68124/90.

[Claims 1, 2, 20, and 21] Referring to Figs. 1-5 and related text, discloses Ogashiwa discloses a method for forming an electronic structure and inherently the structure formed by the method, the method comprising the steps of providing a substrate 2a, 2; and soldering a lead-free solder member 3a to the substrate without using a joining solder to effectuate the soldering (see page 4, lines 13-25), wherein the solder member consists essentially a tin-antimony alloy, and wherein the tin-antimony alloy consists of about 3% to about 15% antimony by weight and a remainder consisting essentially of tin by weight that includes predominantly Sn and about 5 (or 3%) to about 10 % (or 15%) Sb by weight (See Summary, Tables 23 and 24, Table 25, samples 2 and 3); the examiner considers the metals other than Sn and Sb to be of small amount.

[Claims 3, 6, and 23] wherein the soldering step includes inherently reflowing the solder member to make it flow and adhere to the substrate ; wherein the substrate includes a semiconductor chip 2 (see page 4, lines 13-25);

[Claims 31 and 33] wherein the solder member is a solder ball (See Figs. 2 and 3).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor

Art Unit: 2812

and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103[®] and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1-3, 6, 20, 21, 23, 35, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al. (EP 0544915 A1, hereinafter "Yamamoto").

[Claims 1, 2, 20, 21, 35, and 36] Referring to Figs. 4A-8 and related text, discloses Yamamoto discloses a method for forming an electronic structure and inherently the structure formed by the method, the method comprising the steps of providing a substrate 50; and soldering a lead-free solder member to the substrate without using a joining solder to effectuate the soldering (see page 5, lines 5-14), wherein the solder member consists essentially a tin-antimony alloy, and wherein the tin-antimony alloy consists of about 15% antimony by weight or less and a remainder consisting essentially of tin by weight (See page 7, lines 24-28). But it does not disclose expressly the claimed range. However, in the case where the claimed range "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists (See MPEP 2144.05).

[Claims 3, 6, and 23] Yamamoto also discloses wherein the soldering step includes reflowing the solder member to adhere it to the substrate (see page 5, lines 5-14 and page 8, lines 2-5); wherein the substrate includes a semiconductor chip 2 (see page 7, lines 10-17).

Therefore, it would have been obvious to use Yamamoto's teaching to obtain the invention as specified in claims 1-3, 6, 20, 21, 23, 35, and 36.

7. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto or Ogashiwa, as applied above, and in view of Gundotra et al. (US Patent 5369880, hereinafter "Gundotra").

Yamamoto or Ogashiwa discloses substantially the limitations of claim 4, as shown above.

But it does not disclose expressly wherein the soldering step reduces a height of the solder member between about 25% and about 30%.

However, the missing limitation is well known in the art because Gundotra discloses that this range of height reduction is commonly achieved in the art (see col. 3, lines 53-58).

A person of ordinary skill is motivated to modify Yamamoto or Ogashiwa with Gundotra to obtain the desired height reduction appropriate for a specific application .

Therefore, it would have been obvious to combine Yamamoto or Ogashiwa with Gundotra to obtain the invention as specified in claim 4.

8. Claims 7-10, 12-19, 24-28, 30, 32, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto, in view of Yamashita et al. (US Patent 6179935, hereinafter "Yamashita ").

[Claims 7, 12, 24, and 28] The argument used for the rejection of claims 1-3, 6, 20, 21, 23, 35, and 36 also apply. Yamamoto also discloses providing a second substrate 80 and soldering the solder member to a second substrate with a joiner solder 84 (see Fig. 12). But it does not disclose expressly that the joiner solder is lead-free comprising Sn-Ag-Cu alloy with the claimed percentage of Ag and Cu. However, the missing limitations are well known in the art because Yamashita discloses these features (see par. bridging cols. 9 and 10). A person of ordinary skill is motivated to modify Yamamoto with Yamashita to obtain the connection of desired characteristics appropriate for a specific application .

[Claims 8, 19, 25, and 30] The argument used for the rejection of claims 1-3, 6, 20, 21, 23, 35, and 36 also apply.

[Claims 9, 16, 17, and 27] Yamamoto also discloses wherein the step of soldering the solder member to the second substrate includes reflowing the joiner solder at a temperature above a liquidus temperature of the joiner solder and below a highest temperature which will not damage any portion of the electronic structure; wherein the step of soldering the solder member to the second substrate does not include melting the solder member; and wherein the step of soldering the solder member to the second substrate does not include intermixing the solder member material with the joiner solder (see page 11, lines 14-31);

[Claims 10,13-15, and 26] Yamamot discloses the melting point of solder member to be about 240 to 330C (see page 4, last par.) and Yamashita discloses Sn-Ag solder melts at about 221C (see col.10, lines 18-30). It would have been obvious to reflow the joiner solder in the

Art Unit: 2812

range of about 230-250C, temperature only high enough to reflow joiner solder. In the situation where it is desirable to have solder member having a melting temperature in the lower range discloses by Yamamoto, it would have been obvious for a person of ordinary skill in the art to have the solder member melt and intermix with the joiner solder to form even better bond.

[Claims 32 and 34] The combined teaching of Yamamoto and Yamashita discloses substantially the limitations of claims 32 and 34, as shown above. But it does not disclose wherein the solder member is a solder ball. However, solder balls are commonly used for soldering.

Therefore, it would have been obvious to combine Yamamoto with Yamashita to obtain the invention as specified in claims 7-10, 12-19, 24-28, 30, 32, and 34.

9. Claims 5, 18, 22, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto, Ogashiwa, or Yamamoto and Yamashita, in view of Behlen et al. (US Patent 5598033, hereinafter "Behlen").

Yamamoto, Ogashiwa, or Yamamoto and Yamashita discloses substantially the limitations of claims 5, 18, 22, and 29 as shown above.

But it does not disclose expressly wherein the substrate includes a ceramic ball grid array (CBGA) module or a plastic ball grid array (PBGA) module.

However, the missing limitation is well known in the art because Behlen discloses CBGA and PGCA are common type of electronic package (See col. 1, lines 22-33).

A person of ordinary skill is motivated to modify Yamamoto, Ogashiwa, or Yamamoto and Yamashita with Behlen to obtain the desired package appropriate for a specific application.

Therefore, it would have been obvious to combine Yamamoto, Ogashiwa, or Yamamoto and Yamashita with Behlen to obtain the invention as specified in claims 5, 18, 22, and 29.

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for response to this final action is set to expire THREE MONTHS from the date of this action. In the event a first-response is filed within TWO

Art Unit: 2812

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event will the statutory period for response expire later than SIX MONTHS from the date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ha Nguyen whose telephone number is (703)308-2706 . The examiner can normally be reached on Monday-Friday from 8:30AM to 6:00PM, except the first Friday of each bi-week.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Neibling, can be reached on (703) 308-3325. The fax phone number for this Group is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.



Ha Nguyen
Primary Examiner
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